U.S. DEPARTMENT OF ENERGY & NATIONAL NUCLEAR SECURITY ADMINISTRATION

Radiation Protection Job-Task-Analysis and Recommendations

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Executive Summary

The Federal Technical Capability Program (FTCP) is part of the Department of Energy's (DOE) commitment to developing and maintaining a technically competent workforce to accomplish its missions in a safe and efficient manner. The FTCP adheres to the DOE Integrated Safety Management Guiding Principle that federal personnel possess the experience, knowledge, skills, and abilities that are necessary to execute their safety responsibilities. The Federal Technical Capability Panel is responsible for overseeing the implementation of the FTCP and, as part of a complex wide effort, is endeavoring to perform a Job-Task-Analysis (JTA) for all Functional Area Qualification Standards (FAQS). In order to achieve this goal, a team of Subject-Matter-Experts (SME) working within each of the DOE FAQS has been formed to analyze their respective discipline. This report summarizes the results of the Radiation Qualification Standard (DOE-STD-1174-2003).

As part of the JTA process, this team ranked the tasks and competencies in the Radiation Protection Qualification Standard on the relative importance, frequency, and need at entry in order to perform the radiation protection job function. The consensus team ranking for each task and competency can be found in appendix A of this report. Based on the data gathered and group deliberations, the JTA team makes the following recommendations:

- Competency #23, which scored a 2 due to infrequency of use and irrelevance, should be removed from DOE-STD-1174-2003.

- The Technical Qualification Program Competencies 1-8 should be information that Radiation Protection possesses upon entry or transition to the job function.

Acronyms

CFR	Code of Federal Regulations
DOE	Department of Energy
FTCP	Federal Technical Capability Program
JTA	Job Task Analysis
NNSA	National Nuclear Securities Administration
OSQA	Office of Safety and Quality Assurance
RP	Radiation Protection
STD	Standard
SME	Subject Matter Experts
StDv/Std Dev	Standard Deviation
TQP	Technical Qualification Program
TSD	Technical Support Division

Purpose

The purpose of performing a job-task-analysis for the Radiation Protection Standard is to identify the relevant complex-wide tasks and competencies of personnel performing the Radiation Protection (RP) function. The results can then be used to make recommendations for revising the Radiation Protection standard to better reflect the competencies needed to perform everyday tasks of Radiation Protection personnel.

Scope

The scope of this Job-Task-Analysis (JTA) is a complete ranking of the tasks and competencies contained in DOE-STD-1174-2003 as they relate to performing the Radiation Protection job function. The evaluation of the tasks and competencies was performed by Subject Matter Experts (SMEs) currently engaged with the Radiation Protection function within the Department of Energy (DOE) complex.

Team Participants

Sanders, David	DOE-SR (Lead)
Chilton, Milton	NNSA
Parker, Jack	DOE-SR
Radford, Charles	DOE-SR
Wu, Sarah	DOE-SR

Results

Methodology:

The Task Analysis charts, along with the keys, were sent across the Department of Energy complex to Radiation Protection SMEs to perform an individual analysis of task and competencies. The results were combined to arrive at an average score for each task for the frequency and urgency (F) and for the Importance (I) of that particular element. In the TQP

section, the "I" represents, in the opinion of the RP SME, how soon an individual working in RP should acquire the knowledge. A rating of 1 stands for "from day 1" while a rating of 5 means "before the TQP is due." The "Score" is calculated by factoring weighted "I" and "F" values relative to other items on the same list.

Scaling:

The MS Excel formula for the Score in the Tasks (general knowledge base information) section is simply I*F. However, the key sent out initially for the TQP Competencies section was opposite of the first section, so adjustments were made for the "Score" section to correctly interpret the data from "I" and "F" into a meaningful Score. The MS Excel formula for the Score in the TQP Competencies section is "=if (F<4.999, ((I*(5-F)+I)), (I*1))". This obtains a relative value of each item compared to another item in the same chart. The standard deviation was calculated, and is noted as "StDv" on the chart. The total points that individuals assigned to the Importance and Frequency were also noted, to see if there were cases where individuals assigned mostly high or mostly low importance to the entire set of items.

Output:

Appendix A shows the Job-Task-Analysis Worksheets and the average scores given by the SMEs. Appendix B contains the raw data. It also contains the data sorted by Score (F and I) and then also separately by Importance only.

Although the average StDv in both I and F was 0.8, the degree of variance is greater in the Frequency category compared to the Importance category. There were 5 instances where the StDv for Importance were at 1 or higher, and 12 times where the StDv was at 1 or higher in the Frequency category.

The team found that Tasks A, B, C, D, and E were ranked high in Importance and in Frequency. For the Tasks, the same trend occurred, with the Frequency not being in as close of agreement.

For the TQP Competencies specifically, items 1 through 8 were unanimously, considered skills important to have prior to entry or to be acquired early. There were five TQP Competencies that were needed only "prior to qualification," and had no deviation between individuals on the "need by" category. Number 23 (Project Management), had an importance of 2 (lower importance), and a "needed for effective job performance" of 5; which was "needed prior to qualification" (not urgent).

*** Due to the low response rate, there were limitations to what can be interpreted from these results.*

Conclusion

Upon completion of the Radiation Protection JTA, a few recommendations were made by the team. It is recommended that competency #23, which scored a 2, due to infrequency of use and irrelevance, should be removed from DOE-STD-1174-2003. Appendix B summarizes the scores (combination of weighted frequency and importance) from most important and frequently used, to least important and least used. Based on the data gathered, TQP Competencies 1-8 should be information that Rad Protection possesses upon entry or transition to the job function.

References

DOE O 426.1, Chg 1, *Federal Technical Capability,* September 20th, 2011

DOE STD-1174-2003, Radiation Protection Functional Area Qualification Standard, 2003

Appendix A: Job-Task-Analysis Worksheets

Team Consensus Radiation Protection Job-Task-Analysis Worksheets

Job Analysis Worksheet for Tasks

Task	Source	Importance	Frequency
A. Evaluates radiological protection programs to determine whether the program complies with applicable codes, standards, guides, regulations, Orders, and accepted practices.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	4.6	2.4
B. Appraises facilities, procedures, and operations to determine their adequacy to protect the workers and members of the general public from the effects of ionizing radiation.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	4.6	3.2
C. Administers and coordinates radiation protection program(s) for the Department, including independent evaluations and special studies.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	4.0	2.0
D. Provides technical assistance and advice in the area of radiation protection and health physics to other organizations and independent review groups.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	4.4	3.2
E. Reviews Office and/or contractor performance to identify trends indicative of performance or compliance status.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	4.0	2.8
F. Performs technical reviews and provides recommendations on Radiation Protection Program documents (plans, schedules, etc.)	DOE-STD-1174-2012, FAQS Duties	3.6	2.6

	and Responsibilities		
G. Reviews and comments on a wide variety of operating contractor documents.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	3.4	2.6
H. Evaluates, oversees, and provides emergency preparedness and emergency response support related to radiological incidents in conjunction with contractor, Federal, State, and local officials, as required.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	3.8	0.8
I. Develops, reviews and implements radiation control policy, requirements, and guidance.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	3.8	2.2
J. Communicates hazards associated with exposure to ionizing radiation.	DOE-STD-1174-2012, FAQS Duties and Responsibilities	3.6	2.0
Position-specific duties and responsibilities for radiation protection personnel are contained in their office/site/facility-specific qualification standard and/or position description.			

Importance Scale	Frequency
How important is this task to the job?	***How often is this task performed?***
0 = Not Performed	0 = Not Performed
1 = Not Important	1 = Every few months to once e a year
2 = Somewhat Important	2 = Every few weeks to once a month
3 = Important	3 = Every few days to once a week
4 = Very Important	4 = Every few hours to once a day
5 = Extremely Important	5 = Hourly to many times per hour

Job Analysis Worksheet for Competencies

Competency	Source	Importance	Need at Entry
1. Radiation protection personnel shall demonstrate a working level knowledge of the various types of radiation and how they interact with matter.	DOE-STD-1174-2012, FAQS Competency	4.6	1.6
2. Radiation protection personnel shall demonstrate a working level knowledge of radioactivity and transformation mechanisms.	DOE-STD-1174-2012, FAQS Competency	4.2	2.0
3. Radiation protection personnel shall demonstrate a working level knowledge of principles and concepts for internal and external dosimetry.	DOE-STD-1174-2012, FAQS Competency	4.6	2.0
4. Radiation protection personnel shall demonstrate a working level knowledge of the biological effects of radiation.	DOE-STD-1174-2012, FAQS Competency	4.8	1.6
5. Radiation Protection personnel shall demonstrate a working level knowledge of the principles and use of radiological instrumentation and radiological monitoring/survey practices.	DOE-STD-1174-2012, FAQS Competency	4.6	1.8
6. Radiation protection personnel shall demonstrate a working level knowledge of internal and external radiation protection principles and control techniques.	DOE-STD-1174-2012, FAQS Competency	4.6	2.0
7. Radiation protection personnel shall demonstrate a working level knowledge of as-low-as-reasonably-achievable (ALARA) principles, and their application to radiological work activities.	DOE-STD-1174-2012, FAQS Competency	4.2	2.2
8. Radiation protection personnel shall demonstrate a working level knowledge of the application of engineered radiological controls and facility design, including containment/confinement systems.	DOE-STD-1174-2012, FAQS Competency	4.8	3.2
9. Radiation protection personnel shall demonstrate a familiarity level knowledge of the radiological hazards associated with the following and a working level knowledge for site specific radiological hazards:	DOE-STD-1174-2012, FAQS Competency	4.4	4.8

	• Plutonium operations • Uranium operations • Tritium operations • Nuclear explosive operations • Production/experimental reactors • Accelerator operations • Waste handling/processing operations • Decontamination and decommissioning • Use of radiation generating devices • Environmental restoration activities			
10.	Radiation protection personnel shall demonstrate a working level knowledge of the Department of Energy (DOE) radiation protection system for occupational workers as set forth in the following policy, requirements and guidance documents: • 10 CFR 835, Occupational Radiation Protection • DOE G 441.1-1C, Radiation Protection Programs Guide for Use with 10 CFR 835, Occupational Radiation Protection • DOE Policy 450.4A, Department of Energy ISM	DOE-STD-1174-2012, FAQS Competency	4.8	4.2
11.	Radiation protection personnel shall demonstrate a working level knowledge of the following DOE Policy, Order, and Manual Directives, and Technical Standards related to radiation protection: • DOE Policy 450.4, Department of Energy Integrated Safety Management Policy • • DOE Order 458.1, Ch. 1, Radiation Protection of the Public and the Environment • • DOE Order 440.1B, Worker Protection Program for DOE Federal Employees • DOE Manual 231.1-2, Occurrence Reporting and Processing of Operations Information • DOE Order422.1, Conduct of Operations • DOE-STD-1098-2008, Ch. 1, Department of Energy Standard - Radiological Control • DOE-STD-1121-2008, Department of	DOE-STD-1174-2012, FAQS Competency	3.8	5.0

	Energy Standard - Internal Dosimetry			
12.	Radiation protection personnel shall demonstrate a familiarity level knowledge of the identification, reporting, investigation, and enforcement related to potential noncompliance with nuclear safety requirements.	DOE-STD-1174-2012, FAQS Competency	3.2	4.6
13.	Radiation protection personnel shall demonstrate a familiarity level knowledge of radioactive waste management.	DOE-STD-1174-2012, FAQS Competency	3.4	4.8
14.	Radiation protection personnel shall demonstrate a working level knowledge of Department of Energy (DOE) requirements and guidance related to safety management.	DOE-STD-1174-2012, FAQS Competency	3.4	4.4
15.	Radiation protection personnel shall demonstrate a familiarity level knowledge of Federal regulations and Department of Energy (DOE) Orders related to emergency planning and preparedness as they pertain to radiological incidents.	DOE-STD-1174-2012, FAQS Competency	3.8	4.2
16.	Radiation protection personnel shall demonstrate a familiarity level knowledge of Department of Energy (DOE) Orders related to Federal and contractor personnel training and qualification.	DOE-STD-1174-2012, FAQS Competency	2.4	4.6
17.	Radiation protection personnel shall demonstrate a working level knowledge of national and international radiation protection standards and recommendations.	DOE-STD-1174-2012, FAQS Competency	3.4	4.8
18.	Radiation protection personnel shall demonstrate a familiarity level knowledge of the Federal regulations, guidelines, and Department of Energy (DOE) Orders pertaining to the decontamination and decommissioning of nuclear facilities.	DOE-STD-1174-2012, FAQS Competency	3.0	5.0
19.	Radiation protection personnel shall demonstrate a familiarity level knowledge of the standards and Department of Energy (DOE) Orders pertaining to the packaging and transportation of radioactive materials.	DOE-STD-1174-2012, FAQS Competency	3.2	5.0
20.	Radiation protection personnel shall demonstrate a familiarity level knowledge of the Department's philosophy and approach	DOE-STD-1174-2012, FAQS	3.6	3.8

	to implementing Integrated Safety Management.	Competency		
21.	Radiation protection personnel shall demonstrate a familiarity level knowledge of the Department's guidance for the structure, function, and operation of a radiation generating device (RGD) control program as discussed in DOE Programs Guide G 441.1-1C, section entitled Radiation Generating Devices.	DOE-STD-1174-2012, FAQS Competency	3.2	4.6
22.	Radiation protection personnel shall demonstrate a familiarity level knowledge of contract management and administration of contractor organizations participating in the radiological protection programs.	DOE-STD-1174-2012, FAQS Competency	2.8	5.0
23.	Radiation protection personnel shall demonstrate a familiarity level knowledge of the general principles associated with project management.	DOE-STD-1174-2012, FAQS Competency	2.0	5.0
24.	Radiation protection personnel shall demonstrate a working level knowledge of assessment (compliance and performance) principles and techniques necessary to identify facility and program deficiencies, event precursors, potential systemic causes, corrective actions, and best practices.	DOE-STD-1174-2012, FAQS Competency	3.8	4.2
25.	Radiation protection personnel shall demonstrate the ability to evaluate the adequacy of radiation protection programs against the requirements of regulations, Department of Energy (DOE) Orders and rules pertaining to radiation protection.	DOE-STD-1174-2012, FAQS Competency	5.0	3.8
26.	Radiation protection personnel shall demonstrate the ability to trend radiation protection-related information/data.	DOE-STD-1174-2012, FAQS Competency	3.8	4.4
27.	Radiation protection personnel shall demonstrate the ability to effectively communicate the hazards associated with exposure to ionizing radiation.	DOE-STD-1174-2012, FAQS Competency	4.4	3.2

Importance Scale	Frequency
How important is this competency for effective job performance?	***When is this competency needed for effective job performance?***
1 = Not Important	1 = Needed the first day
2 = Somewhat Important	2 = Must be acquired within the first 3 months
3 = Important	3 = Must be acquired within the first 4-6 months
4 = Very Important	4 = Most be acquired after the first 6 months
5 = Extremely Important	5 = Must be acquired prior to qualification

Appendix B: Data Analysis Tables

Summary of Team JTA Responses for Tasks

	Raw Data: Responses from Task Analysis for Radiation Protection															
	I=Importance, F=Frequency															
		Avg	StDv	Avg	StDv	Person A		Person B		Person C		Person D		Person E	
Score	Item	I	I	F	F	I	F	I	F	I	F	I	F	I	F
11.0	A	4.6	0.89	2.4	1.52	3	4	5	4	5	2	5	1	5	1
14.7	B	4.6	0.55	3.2	1.1	4	4	5	4	5	2	5	4	4	2
8.0	C	4	0.71	2	1.58	4	3	4	4	5	0	3	1	4	2
14.1	D	4.4	0.55	3.2	0.84	4	4	5	4	4	3	5	3	4	2
11.2	E	4	0.71	2.8	0.84	3	4	5	3	4	2	4	3	4	2
9.4	F	3.6	1.14	2.6	1.14	2	4	5	3	4	2	3	3	4	1
8.8	G	3.4	0.89	2.6	0.55	3	3	4	3	4	2	2	3	4	2
3.0	H	3.8	0.45	0.8	0.45	4	1	3	1	4	0	4	1	4	1
8.4	I	3.8	0.84	2.2	1.3	3	4	4	2	5	1	3	1	4	3
7.2	J	3.6	0.55	2	1	3	3	3	1	4	1	4	2	4	3
	Total	40		24		33	34	43	29	44	15	38	22	41	19
	Average Tot. for I	40													
	Average Tot. for F	24													
	Avg. StDv for I	0.7													
	Avg. StDev for F	1													

Importance Scale	Frequency
How important is this task to the job?	***How often is this task performed?***
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5 = Extremely Important	5 = Hourly to many times per hour

Summary of Team JTA Responses for TQP Competencies

	TQP Competencies														
	I=Importance, F=Frequency														
		Avg	StDv	Avg	StDv	Person A		Person B		Person C		Person D		Person E	
Score		I	I	F	F	I	F	I	F	I	F	I	F	I	F
20.2	1	4.6	0.55	1.6	0.55	4	2	5	1	5	1	4	2	5	2
16.8	2	4.2	0.84	2	1.22	3	4	5	1	5	1	4	2	4	2
18.4	3	4.6	0.55	2	1.22	5	2	5	1	5	1	4	4	4	2
21.1	4	4.8	0.45	1.6	0.55	5	2	5	1	5	1	4	2	5	2
19.3	5	4.6	0.55	1.8	0.84	5	2	5	1	5	1	4	3	4	2
18.4	6	4.6	0.89	2	1.22	5	2	5	1	5	1	3	4	5	2
16.0	7	4.2	0.84	2.2	1.3	4	1	5	1	4	3	3	4	5	2
13.4	8	4.8	0.45	3.2	1.64	5	2	5	1	5	5	5	4	4	4
5.3	9	4.4	0.55	4.8	0.45	5	5	5	5	4	5	4	5	4	4
8.6	10	4.8	0.45	4.2	1.3	4	4	5	5	5	2	5	5	5	5
3.8	11	3.8	0.84	5	0	3	5	5	5	4	5	3	5	4	5
4.5	12	3.2	0.84	4.6	0.89	4	3	3	5	4	5	2	5	3	5
4.1	13	3.4	1.14	4.8	0.45	3	4	3	5	4	5	2	5	5	5
5.4	14	3.4	0.55	4.4	0.89	3	3	3	5	4	5	3	5	4	4
6.8	15	3.8	1.3	4.2	1.3	5	2	2	5	5	4	3	5	4	5
3.4	16	2.4	1.14	4.6	0.55	4	4	1	5	3	5	2	5	2	4
4.1	17	3.4	0.55	4.8	0.45	3	5	3	5	4	5	3	5	4	4
3.0	18	3	1	5	0	4	5	2	5	3	5	2	5	4	5
3.2	19	3.2	0.84	5	0	4	5	2	5	3	5	3	5	4	5
7.9	20	3.6	1.14	3.8	1.1	3	3	2	5	5	3	4	5	4	3
4.5	21	3.2	0.84	4.6	0.89	2	5	4	5	4	3	3	5	3	5

2.8	22	2.8	0.84	5	0	3	5	2	5	4	5	2	5	3	5
2.0	23	2	0.71	5	0	2	5	2	5	3	5	1	5	2	5
6.8	24	3.8	0.84	4.2	1.3	4	2	3	5	5	5	4	5	3	4
11.0	25	5	0	3.8	1.3	5	2	5	5	5	3	5	5	5	4
6.1	26	3.8	0.84	4.4	1.34	5	2	3	5	4	5	3	5	4	5
7.9	27	4.4	0.89	3.2	1.79	4	3	3	5	5	1	5	5	5	2
	Total	104		102		106	89	98	103	117	95	90	120	108	102
	Average Tot. for I			104											
	Average Tot. for F			102											
	Avg. StDv for I			0.8											
	Avg. StDv for F			0.8											

Importance Scale	Frequency
How important is this competency for effective job performance?	***When is this competency needed for effective job performance?***
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4 = Very Important	4 = Most be acquired after the first 6 months
5 = Extremely Important	5 = Must be acquired prior to qualification

Summary of Relative Scoring For Tasks

By Overall Score

Score	Item #
14.7	B
14.1	D
11.2	E
11.0	A
9.4	F
8.8	G
8.4	I
8.0	C
7.2	J
3.0	H

By Importance Only

	Avg I	Std Dev I
A	4.6	0.89
B	4.6	0.55
D	4.4	0.55
C	4	0.71
E	4	0.71
H	3.8	0.45
I	3.8	0.84
F	3.6	1.14
J	3.6	0.55
G	3.4	0.89

Summary of Relative Scoring For TQP Competencies

By Overall Score

Score	TQP Item #
21.1	4
20.2	1
19.3	5
18.4	3
18.4	6
16.8	2
16.0	7
13.4	8
Six Months	
11.0	25
8.6	10
7.9	20
7.9	27
6.8	15
6.8	24
6.1	26
Before TQP Due	
5.4	14
5.3	9
4.5	12
4.5	21
4.1	13
4.1	17
3.8	11
3.4	16
3.2	19
3.0	18
2.8	22
2.0	*23

By Importance Only

	Avg I	Std Dev I
25	5	0
4	4.8	0.45
8	4.8	0.45
10	4.8	0.45
1	4.6	0.55
3	4.6	0.55
5	4.6	0.55
6	4.6	0.89
9	4.4	0.55
27	4.4	0.89
2	4.2	0.84
7	4.2	0.84
11	3.8	0.84
15	3.8	1.3
24	3.8	0.84
26	3.8	0.84
20	3.6	1.14
13	3.4	1.14
14	3.4	0.55
17	3.4	0.55
12	3.2	0.84
19	3.2	0.84
21	3.2	0.84
18	3	1
22	2.8	0.84
16	2.4	1.14
23	2	0.71